

With respect to Claim 9, Applicants disclose a photoelectric converter (e.g., CCD imaging apparatus) that employs a gate portion (i.e., gate 12 in Figs. 1A and 1B) having two types of gates: a readout gate 12A and a gate 12B not related to readout, which may be accurately and alternatively referenced as a barrier gate as would be understood by one skilled in the art based on the context of the original specification. (Application, pg. 7 line 15 - pg. 8 line 21; Figs. 1A & 1B). The context of the original specification discloses that charges from the photodiode portion 1 may be read out to the vertical CCD portion 3 by the readout gate 12A and that the barrier gate 12B (the gate not used for charge readout) dominates the readout gate 12A where the two types of gates overlap. (Application, pg. 8 lines 9-21). In addition, the original specification discloses that "an electric field applied to that [overlap] portion is intensified during activation so that charges within the photodiode portion 1 can be easily read out." (Application, pg. 8 lines 15-21). Therefore, the original specification supports that gate 12B, not used for charge readout when voltage is applied to the gate portion 12, acts as a barrier gate to enable charges to be transferred via the readout gate 12A.

With this amendment, Applicants have amended the specification to clearly indicate that gate 12B of gate portion 12 is a barrier gate and not a read out gate type. For the foregoing reasons, Applicants submit no new subject matter has been added with the amendments to the specification, nor has new subject matter been added with the limitations of Claim 9.

While the Examiner has not provided any specific reasons for asserting that Claim 10 adds new subject matter, Applicants submit that the original specification expressly supports the limitations of Claim 10. Specifically, the original specification states that the gate portion "serves, during off operation (i.e., Off state), as an adequate barrier against charges so that there

is no leak of charges from the photodiode portion 1 to the vertical CCD portion 3 and no leak of light to the vertical CCD portion 3.” (Application, pg. 9 lines 8-13).

Accordingly, Applicants respectfully request that the Examiner withdraw this rejection to Claims 9 and 10.

## **II. 35 U.S.C. § 103(a) Obviousness Rejection of Claims**

The Examiner rejected claims 1-10 under 35 U.S.C. 103(a) as being purportedly being unpatentable over Kuno, U.S. Patent No. 5,365,093, or Applicants’ admitted prior art in view of Stevens et al, U.S. Patent No. 5,514,886. Applicants respectfully traverse this rejection.

Applicants disclose that, as the size of unit cells of CCD imaging apparatus (i.e., photoelectric converter) decrease or become more compact, a problem arises with reading out charges from a light receiving portion (e.g., photodiode) of a pixel unit cell to a *vertical* CCD charge transfer portion of the imaging apparatus. (Application pg. 1 line 14 - pg. 2 line 21; Fig. 7). To solve this read-out problem from a light receiving portion or photodiode, Applicants teach and claim a photoelectric converter that has the following limitations, among others:

“a gate portion having a first side and a second side that both define a readout gate width, the first side confronting the output end of the light receiving portion; and

a charge transfer portion formed to confront the second side of the gate portion, wherein the readout gate width of said gate portion is wider at the first side confronting said light receiving portion than at the second side confronting said charge transfer portion.” (Claim 1).

Applicants teach that a gate portion having this structure improves the read out of a charge from a light receiving portion or photodiode into the vertical charge transfer register. (Application pg. 7 line 4 - pg. 9 line 13).

Conversely, Kuno discloses a CCD linear sensor that has a read-out gate 3a with structure that is opposite to that taught and claimed by Applicants. Kuno teaches that its read-out gate 3a is wider at the side confronting the charge transfer portion (i.e., shift register 4a) than at the side confronting the light receiving portion (i.e., photosensitive region (6)). (Kuno, Col. 4 lines 34-43; Fig.1). Kuno further teaches that with “the pattern formation of its read-out gate 3a, the signal charges transferred from the photosensitive region 6 are transferred at a high efficiency to the shift register 4a because the reading-out electric field increases in the channel region 2 under the read-out gate.” (Kuno, Col. 4 lines 38-43). Thus, there is no suggestion or motivation to modify the CCD linear sensor of Kuno to have a gate portion with a readout gate width that is wider at the first side confronting said light receiving portion than at the second side confronting said charge transfer portion as taught and claimed by Applicants because Kuno teaches the opposite to obtain a higher efficiency of charge transfer to the charge transfer portion.

Stevens discloses an image sensor or CCD that has a horizontal charge transfer register (See channel 7, barriers 3 and 5, and electrode patterns  $\phi H1$  and  $\phi H2$  in Figs. 6 and 7a of Stevens) and an output gate 12 that is disposed between the last phase (See  $\phi H1$  in Fig. 6 of Stevens) of the horizontal charge transfer register and an output region 11 of the CCD. Stevens teaches that the channel width of the output gate 12 is tapered to be wider towards the last phase ( $\phi H1$ ) of the horizontal charge transfer register to solve the problem of two and three dimensional effects associated with the last stage or phase ( $\phi H1$ ) of the CCD. (Stevens Col. 1 line 17 - Col. 2 line 5; Col. 2 line 65 - Col. 3 line 32; Col. 4 lines 50-67; Figs. 1,2, 6, and 7a).

Stevens, however, fails to disclose a readout gate for a pixel (i.e., a pixel unit cell as shown in Figs. 1B, 2B, 3B and 7 of the Application) that confronts both a light receiving portion

(e.g., photodiode) and a charge transfer portion (e.g., vertical CCD 3 of the Application) as taught and claimed by Applicants. Thus, Stevens, alone or in combination with any of the cited references, fails to teach the limitations of Claim 1. In addition, because Stevens addresses a different problem and solution for CCD imaging device than that disclosed by Applicants, Applicants submit there is no motivation or suggestion to combine any teaching of Stevens with the prior art disclosed by Applicants. Accordingly, Applicants request the Examiner remove the rejection to Claim 1.

Claims 2-10 depend from Claim 1 and should be allowable for at least the same reasons as Claim 1. Accordingly, Applicants request that the Examiner withdraw the rejection to these Claims.

### CONCLUSION

In view of the above amendments and remarks, Applicant submits that all claims are clearly allowable over the cited prior art, and respectfully requests early and favorable notification to that effect. If the Examiner believes that a conference would be of value in expediting the prosecution of this application, the Examiner is invited to telephone the undersigned counsel to arrange for such a conference.

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